

From: Philip B. Stark stark@stat.berkeley.edu 
Subject: Re: Re: Official statements (subject change)
Date: December 26, 2019 at 12:42 PM
To: David Dill [REDACTED]
Cc: Richard DeMillo rich@demillo.com, Marilyn Marks [REDACTED], Barbara Simons [REDACTED],
 GARLAND FAVORITO [REDACTED], David Jefferson [REDACTED], David L. Dill [REDACTED],
 Donna Curling dcurling0531@gmail.com, Donna Price donnaprice@gaverifiedvoting.org, Ronald L. Rivest [REDACTED],
 [REDACTED], Richard A. DeMillo rad@demillo.com

PS

Dear Dave--

There's essentially zero "risk for the machine hacker" that voter complaints about BMDs will lead to detection or action on the part of election officials, much less to prosecution. Countless news stories show that despite blatant machine malfunctions, LEOs bless the results. Northampton PA is the latest of many examples. LEOs are just not going to call for a new election.

Mounting evidence (the two studies by Rich and Marilyn, and new work by Alex, Matt and others) shows that few voters check and those who do rarely notice alterations. Moreover, many jurisdiction-wide contests are decided by less than a few percent of ballots, and small contest outcomes with large margins can be altered by changes to far far less than a few percent of ballots. That's one reason parallel testing can't be effective.

Correctly tabulating a trustworthy paper trail produces a trustworthy outcome. Correctly tabulating an untrustworthy paper trail shows nothing.

An RLA can confirm outcomes if the paper trail is trustworthy. If the paper trail is untrustworthy, there is no evidence to tell whether the reported outcome is correct or not.

Regards,
 Philip

On Thu, Dec 26, 2019 at 9:31 AM David Dill <[REDACTED]> wrote:
 Rich,

Thanks, I'll think this through and write it more carefully in this email.

I think our primary concern should be about wholesale attacks. I'm really focused on the difficulty of an attack without being detected.

I agree that attacks on individual machines or groups of machines are not difficult to execute. There is no equipment where it's hard to actually change the software, and the attacks I'm most worried about are those that don't involve tampering with individual machines, but all the machines in a jurisdiction, from a contractor that maintains them or from the manufacturer. My attitude is that preventing malware is basically hopeless, and the only useful thing we can do is avoid the computer or audit it.

Without tabulation audits, it would be a good strategy to attack the tabulators because

(1) most ballots are hand-marked, anyway. This point doesn't help much if the contest in question is limited to an BMD-for-all jurisdiction. Many of the most important contests include a mixture of voters or jurisdictions, most of which use hand-marked ballots. So, the greatest leverage would be in attacking the tabulators (in the absence of good tabulation audits).

(2) some voters will check their ballots and complain if they did not record the vote accurately creates a risk for the machine hacker. My guess is that an effective hack would have to go to some trouble to avoid repeatable changes by (a) limiting the number of changes to a few percent, and (b) trying to recognize when a voter is re-doing a ballot. Maybe it would be sufficient just to avoid changing two consecutive ballots. So, maybe it would be effective to attack the BMDs, but it would be better to go for the tabulators where there is little risk of detection.

After 2016, many of us realized that the success of our hard work to get people to vote on paper ballots wasn't helping much because of weak or non-existent tabulation audits. So, Verified Voting started to focus on getting tabulation audits, and in educating and enlisting the cooperation of election officials to accelerate the acceptance of RLAs, based on the above considerations.

Dave

On Thu, Dec 26, 2019 at 8:57 AM Richard DeMillo <rich@demillo.com> wrote:

Dave,

Whether it's risky or not for the hacker depends entirely on which BMDs you're talking about. Georgia's Dominion ImageCast system for example connects a consumer grade HP LaserJet printer to the touchscreen by an exposed USB cable. It took us 30 minutes to design and mount a successful man in the middle attack. Not published yet and part of a larger study so please don't cite or quote beyond this group. Printers also ship with AirPrint enabled "for those jurisdictions that want a mobile ballot printing solution." I sat in my car outside a Paulding County polling place and watched the LAN t radiating. Moreover, the web stack for the printer management interface is disabled by a simple password protected terminal command from the touchscreen. My bet is that it's a single state-wide password. That would allow an oblivious attacker to cancel any print job or substitute a previously stored PS file.

The reliance on bog box store grade components is horrifying. I know a little about the supply chains for those printers, and there's no reason to believe that parts suppliers can't be swapped at will, an interesting risk since HP no longer manufactures these printers for a mass market. These and a dozen vulnerabilities are bundled into arguably the most critical subsystem: the ballot printer. All can be mounted without touching the printer's firmware (which IMO is another goldmine) An adversary would have complete control over what is on the ballots that get scanned and tabulated independent of any voter-initiated actions on the touchscreen.

Since these printed ballots are likely not even glanced at by voters, fraudulent ballots would be undetected, and (you know the argument from this point on) even if examined would escape detection,

To make matters worse, the ImageCast management console helpfully offers the choice of DRE mode setup, which bypasses ballot printing altogether.

Rich

Sent from [Mail](#) for Windows 10

From: [David Dill](#)

Sent: Thursday, December 26, 2019 12:44 AM

To: [Marilyn Marks](#)

Cc: [Philip B. Stark](#); [Barbara Simons](#); [Richard DeMillo](#); [GARLAND FAVORITO](#); [David Jefferson](#); [David L. Dill](#); [Donna Curling](#); [Donna Price](#); [Ronald L. Rivest](#); [Ronnie Martin](#)

Subject: Re: Official statements (subject change)

I agree that a tabulation audit does NOT capture full evidence of voter intent. It checks the tabulation. I think VV needs to be more careful in communicating what tabulation audits can achieve.

For hand-marked paper ballots (which are the VAST majority of ballots cast in the U.S.) tabulation audits, and RLAs in particular, are the most important deterrent to hacking of ballot counting computers, which I think is a very likely attack because of its wholesale nature.

Hacking BMDs is more risky for the hacker. The hacking CAN actually be caught by voters who check their ballots. I understand and share the concerns about relying on that part of the process, but, at this point, hacking optical scanners would be probably be the cheapest, least risky way to directly steal an election without being detected.

Dave

On Wed, Dec 25, 2019 at 5:44 PM Marilyn Marks <[REDACTED]> wrote:

David,

I'm worried about the dilution of the concept of a tabulation audit (including an RLA). VV had it right in 2018, and I urge VV not to abandon that definition for a less important procedure that few in the real world would actually care about. I think that trying to redefine post-election audits to apply to a poor process (BMDs) invites serious degradation of the post-election review process, and will create huge confusion among voters, the candidates, the parties, and the courts. **There is simply no reason to call every post-election test an audit.**

VV had it right in the definition I highlighted in yellow below in the thread. Why abandon this?

Referencing this "new" definition of tabulation audits, you write—"Tabulation audits are very important, perhaps the most important audits to do at this time." I don't see how this could possibly be "most important." If the audit is not working with a reliable source record (and BMDs cannot provide that), then we cannot know if there has been interference of bad programming or a hack. I don't see how we can promote the idea that something is more important than that. We have to have both the accurate source record and the right math. Not one or the other.

Imagine if CPAs suddenly changed their definition about what an audit includes and decides that it no longer includes the fairness of the financial statements in all material respects, and is just a presentation of the company's books with limited review to make sure that the books balance? Banks and stockholders would not accept that as the voters should not accept a dumbed down idea of tabulation audits. And EI community should surely stop promoting them.

After all, what you seem to be defining as a tabulation audit is the work that most canvass boards are already required to do under most states' statutes as part of the job of canvassing. Is it the intent to check the work of the canvass board?

Also, I think that the concept of ensuring that "voter intent" was recorded can become a real tarpit. We will never know what "voter intent" is/was and we should be careful about implying that it is possible. What is important is what the voter expressed as her vote on the ballot is as far back as we can go. I've seen BMD advocates argue that that HMPB must be checked for "voter intent" if BMDs are to be checked for "voter intent." A bad idea and use of terminology in both cases.

Barbara says below, "I must emphasize yet again that our most recent statements/letters dominate older ones." I'm not sure that I know what that means specifically as it relates to the GA audits, the comments that Lindeman made, the correspondence with the SOS over the last few months, the 2018 papers on audits. Readers trying to understand VV's position or become educated on RLAs would have quite a difficult time understanding the conflict in the statements, or if they are intended to be co-existing statements. I think that VV leaders are underestimating the confusion that the conflicting positions create.

I fear that what is happening here is that VV is attempting to unilaterally redefine RLAs and tabulation audits as a matter of convenience, and no doubt some other non-profits agree with that, but somehow I hope that is not permitted to happen.

Barbara, to demonstrate the problem in changing the definition of a tabulation audit---as I understand it, VV has told several people that it helped draft the language in HB316 re: audits. It calls for "" starting in November, and RLA pilot a few years out. So when the bill was passed, it meant a test of outcomes, and now if the world is to accept VV's new definition, it is a far lesser procedure, with no real assurance that is useful to a losing candidate. I Hope you can see how troubling it is when "redefinitions" attempt to change a legal requirement.

Would VV consider maintaining the tabulation audit definition it had (although voter intent phrase is tricky), and not diluting it?

Thanks for considering these issues.

Marilyn

From: David Dill <[REDACTED]>
Date: Wednesday, December 25, 2019 at 5:58 PM
To: "Philip B. Stark" <stark@stat.berkeley.edu>
Cc: Barbara Simons <[REDACTED]>, Marilyn Marks <[REDACTED]>, Rich DeMillo <rich@demillo.com>, Garland Favorito H <[REDACTED]>, David Jefferson <[REDACTED]>, "David L. Dill" <[REDACTED]>, Donna Curling <dcurling0531@gmail.com>, Donna Price <donnaprice@gaverifiedvoting.org>, "Ronald L. Rivest" <[REDACTED]>
Subject: Re: Official statements (subject change)

Philip,

I really think your recent definition of RLAs is revisionist. This is just a terminological point that doesn't change the need for trustworthy paper ballots, but precise terminology is important and changing definitions that were carefully written and are now commonly accepted is very confusing.

In the past, I asked you personally for clarification of the definition of RLAs, and the essence of the definition is that an RLA is an audit that bounds the probability that a full manual tally will change the outcome of the election. That's a great definition, and, like most definitions, it has sharp boundaries. Obviously, if you have unreliable paper ballots, a full manual tally has the same "garbage-in, garbage-out" property that the random tabulation audit would have.

A "full audit" of an election would include audits of lots of other things, some of which we do better than others. To trust the outcome, we'd like to check that the ballot marking accurately represented voter intent, that the physical chain of custody of ballots was preserved, that the votes cast equals the voters signed into the poll book, that people who tried to vote were able to do so if and only if they were eligible (including meeting registration requirements). Etc.

RLAs are understood to be tabulation audits. Tabulation audits are very important, perhaps the most important audits to do at this time. But they're not everything that needs to be done to ensure that the outcome of an election represents voter intent.

Dave

On Wed, Dec 25, 2019 at 10:52 AM Philip B. Stark <stark@stat.berkeley.edu> wrote:

| With regard to this statement:

The ASA statement says "To be risk-limiting, the overall procedure must ensure that if the machine-count electoral outcome is incorrect, there is a large, pre-specified chance that the audit will reveal the correct outcome." Even though the new crop of BMDs had not hit the market in 2010 (so the issue of voter verification of paper ballots didn't exist), the phrase "chain of custody" does not appear in the statement. In other words, the ASA appears to view an RLA strictly as an algorithm, which is how we all viewed it at the time.

That is *not* viewing an RLA as an algorithm. It is explicitly a *functional* definition: a RLA has to ensure that the overall procedure has a large, pre-specified chance of finding the correct outcome. If the paper trail is not trustworthy, no procedure can have a large, pre-specified chance of correcting the outcome if the outcome is wrong. *Trustworthy* paper is required. That requires secure chain of custody. And it requires a trustworthy way of marking the paper.

I am not advocating changing the definition of RLA in any way, and certainly not putting HMPB into the definition.

RLAs simply require trustworthy paper: no procedure can limit the risk of certifying wrong outcomes if the paper trail is not trustworthy. All that's changed since the original definition of RLAs is the explicit recognition that BMD output is not trustworthy. That doesn't change the definition of RLAs. It just shows they are not possible using BMDs, just like they are not possible without paper, and not possible if the paper trail has not been secured/curated well.

Happy holidays,

Philip

On Tue, Dec 24, 2019 at 7:26 PM Barbara Simons <[REDACTED]> wrote:

Hello, Marilyn.

This is my second response. I know that you have raised other issues, and I'll attempt to get to them, as I find the time. I'm sure you appreciate that I have other things happening in my life now.

Before getting into the substance of my response, I'd like to address your point 2) below that quotes an Aug, 2018 VV document. I agree that the quote is not what we would say today. As I discuss below, there is a history behind the understanding of an RLA. The quote you included is one of several that I expect we all - and I'm including some people who have never been or no longer are associated with VV - would like to update, given current knowledge. I give a couple of examples below.

I must emphasize yet again that our most recent statements/letters dominate older ones. Perhaps it might be worthwhile for staff to edit the 2018 document to make it consistent with our current position, though I would not make it a high priority item. Staff have lost a lot of time dealing with all that has happened in the past month, to say nothing of the tremendous stress we all have felt with VV being trashed in a national publication and elsewhere.

You asked if VV's position has changed in the past 45 days. Whether or not it's changed may be in the eyes of the beholder. I believe that we have clarified some areas in ways that I would have expected to please you. For example, near the top of VV's website, you'll find the headline "Verified Voting Statement on Ballot Marking Devices and Risk-limiting Audits – December 17, 2019", together with the first portion of the statement and the link to the full statement: <https://www.verifiedvoting.org/bmd-rla-statement-dec2019/>.

Because the VV statement is very short, I've included the full text below. It represents VV's official position, independent of any previous quotes or documents. Note that it says that 1) BMD ballots may not accurately capture the voter's intent, 2) VV opposes the purchase and deployment of BMDs for all, 3) VV states that if the voter finds a discrepancy with her ballot, it's essentially impossible to determine the cause of that discrepancy, including whether or not there's a problem with the BMD, 4) for these and other reasons VV recommends that the use of BMDs be minimized. It also says that an RLA is a tabulation audit only and does not check that the BMDs accurately captured the voters' choices, etc.

Furthermore, the VV statement explicitly states that any assistance VV provides with RLA pilots does NOT imply any

Furthermore, the VV statement explicitly states that any assistance VV provides with RLA pilots does not imply any kind of endorsement of the equipment, etc. We made a similar statement in the GA letter.

I realize that BMDs have changed our common understanding of a "voter marked paper ballot". Consequently, Philip and some other folks want to limit the definition of an RLA to apply only to HMPBs + a strong chain of command. I think people can differ in their perspective (tabulation audit vs audit of only HMPBs + strong chain of custody) without acrimony - at least I hope so.

And now to a relevant historical example. In 2010 the American Statistical Association issued a statement in support of risk-limiting post-election audits. The general endorsement is still on the ASA website at <https://www.amstat.org/asa/News/ASA-Endorses-Post-Election-Audits-Principles.aspx>. The precise statement is at https://www.amstat.org/asa/files/pdfs/POL-Risk-Limiting_Endorsement.pdf. My recollection (Philip, please correct me if I'm wrong) is that Philip played a key role in getting that ASA endorsement which, I note, has neither been updated nor removed from the webpage.

The ASA statement says "To be risk-limiting, the overall procedure must ensure that if the machine-count electoral outcome is incorrect, there is a large, pre-specified chance that the audit will reveal the correct outcome." Even though the new crop of BMDs had not hit the market in 2010 (so the issue of voter verification of paper ballots didn't exist), the phrase "chain of custody" does not appear in the statement. In other words, the ASA appears to view an RLA strictly as an algorithm, which is how we all viewed it at the time.

Deploying an RLA instead of a fixed percentage count was a huge advance. We all were very appreciative of the major contribution that Philip made, and I recall being delighted that the ASA had issued its statement of support.

There also is more recent history. I haven't looked at the RLA legislation in Colorado and Rhode Island, but I just read the relevant portions of HR1 and I expect the state legislation is similar. I've included the HR1 definitions below, after the VV statement. They are consistent with the former definition of an RLA as an algorithm applied to a set of scanned ballots that checks the outcome.

The HR1 text is similar to that of the ASA, saying: "if the reported outcome of the election is incorrect, there is at least a predetermined percentage chance that the audit will replace the incorrect outcome with the correct outcome ..."

By contrast with HR1, VV's statement makes clear that an RLA applied to a BMD election cannot determine the correct outcome of that election.

VV's earlier statements, such as the one you referenced, represented the understanding at the time, as did statements that many RLA supporters have made over the years. Our collective understanding has changed rather recently. I don't understand why you are singling us out for saying what everyone else was saying concurrently.

For what it's worth, my personal view, which I realize differs from Philip's, is that an RLA is an algorithm, and like any algorithm the quality of the output depends on the quality of the input. If voters don't verify their ballots, then while an RLA can determine the correctness of the tabulation of those ballots, it cannot determine the correctness of the election outcome.

One possible approach, that I think was suggested initially by Harvey B, may be to refer instead to a tRLA, with the t (or T) standing for tabulation. I could live with that, though it's not currently VV policy and I'm not convinced it's needed, so long as our current position is clear, which I believe it is.

And, then there's the messy business of legislative wording that reflects people's previous understanding. If we have a future in which it's possible to pass legislation along the lines of HR1, we all will want to work on updating the wording. (I wouldn't be surprised if some on this email contributed to the original wording). Unfortunately, that's not a high priority for now, given that HR1 is not about to become law.

Regards,
Barbara

----Here is the VV statement on BMDs and RLAs----

This statement is intended to clarify Verified Voting's position regarding the use of ballot-marking devices (BMDs) in elections, and the use of risk-limiting audits (RLAs). It is approved by the President, Board of Directors, and Staff of Verified Voting.

Ballot-marking devices

Verified Voting believes that voters should vote on paper ballots, but we recognize an important

distinction between hand-marked and machine-marked ballots. Hand-marked paper ballots are not subject to inaccuracies or manipulation from software bugs or malicious code. In contrast, machine-marked paper ballots produced using BMDs might not accurately capture voter intent if the software or ballot configuration is buggy or malicious.

Verified Voting specifically opposes the purchase and deployment of new voting systems in which all in-person voters in a polling place are expected to use BMDs. The trustworthiness of an election conducted using BMDs depends critically on how many voters actually verify their ballots, and how carefully they do it. All voters who vote on BMDs should be made aware of the importance of carefully and conscientiously verifying their ballots before casting them, and should be actively encouraged to do so. However, empirical research thus far shows that few voters using BMDs carefully verify their printed ballots. Moreover, if voters do verify BMD-marked ballots and find what they believe are discrepancies, there is no reliable way to resolve whether the voters made mistakes or the BMDs did. For these and other reasons (such as cost) Verified Voting recommends that the use of BMDs be minimized.

Risk-limiting audits

A risk-limiting audit (RLA) is a tabulation audit. It uses statistical methods to provide confidence that the paper ballots are correctly tabulated. It checks only the tabulation. It does not check — among other things — that the BMDs correctly captured the voters' choices, nor that voters actually verified their ballots, nor that the ballots tabulated are exactly those that should be, with none added, modified or lost.

Verified Voting recommends that any electronic tabulation of paper ballots be checked by a risk-limiting audit. We assist jurisdictions in piloting or running such tabulation audits. However, Verified Voting's assistance with RLA pilots or RLAs does not imply that Verified Voting endorses that jurisdiction's equipment, procedures, or election outcomes.

Best practices

Verified Voting strongly advocates for best practices, including hand-marked paper ballots (with some judicious use of BMDs), careful voter verification of machine-marked ballots, strong chain of custody for all paper ballots, proper ballot accounting, and risk-limiting audits to verify tabulations of paper ballots.

----Here is the relevant text from HR1----

Sec 1502. (2)(A)(i) PAPER BALLOT REQUIREMENT... For purposes of this subclause, the term 'individual, durable, voter-verified paper ballot' means a paper ballot marked by the voter by hand or a paper ballot marked through the use of a nontabulating ballot marking device or system, so long as the voter shall have the option to mark his or her ballot by hand.

Sec. 3011. Sec. 299(b)(2) Risk-Limiting Audits Described ... under which, if the reported outcome of the election is incorrect, there is at least a predetermined percentage chance that the audit will replace the incorrect outcome with the correct outcome as determined by a full, hand-to-eye tabulation of all votes validly cast in that election that ascertains voter intent manually and directly from voter-verifiable paper records.

On 12/24/19 2:17 PM, Marilyn Marks wrote:

Barbara,

Thanks for your note.

I'm sorry that you feel that critics of VV's actions of the last 2 years in GA are "assigning blame." That is not the point. The point is to understand VV's actions and position, and hopefully to seek solid clarification from VV on what its position is in hopes that the position is consistent with those of us who have been fighting BMDs and so-called "RLAs" of their results.

It is an important issue, not just for GA, but for NC, FL, PA and other states. I'm very nervous about VV beginning to interact in NC, for example. VV wrote an excellent letter to the NCSBE, but I'm frightened that we'll see VV in the mix of people like David Becker who are trying to tell NCSBE Chair that BMDs can be audited and they will help with the RLAs.

If VV's position has changed in the last 45 days, we would certainly like to know. If it hasn't changed, that would be helpful to know too.

Maybe it is simpler just to focus on the still open and confusing issues in GA. If you could respond to these questions, I'm sure it would clear up a lot:

1. Does VV stand by Lindeman's comments to the press about what the Cartersville audit accomplished? (in the article linked here. <https://www.ajc.com/news/state--regional-govt--politics/paper-ballots-recounted-check-election-results-georgia/sjlqz7asq8SLLkTgGZszRI/>)

2. Does VV still describe a tabulation audit as follows?

"Tabulation audits are intended to provide a quality control check that the reported results of an election match the intent of the voters. There are other valuable audits of the electoral process, but tabulation audits are particularly important because they assess the direct evidence of voter intent for a particular election -- the voters' marks on ballots. Tabulation audits may detect errors or interference with the elections in time to correct those errors." <https://www.verifiedvoting.org/wp-content/uploads/2018/09/Checking-The-Paper-Record-Tabulation-Audit-Oversight-Guide.pdf>

3. Was a tabulation audit conducted in Cartersville with VV's assistance?

4. What is VV's expectation of being involved with the GA SOS on future projects?

I'm assuming that you have seen the continuing name calling from SOS Raffensperger, -- this being the latest today in the Washington Post—where his office said that Rich DeMillo is leading an "national activist disinformation campaign." SOS has been accusing us of trying to "derail elections," claiming that we are "fringe groups," and want to violate election law, and threatening us with prosecution on fabricated allegations.

I doubt if anyone on this thread other than VV board members know the answer to these very elementary questions. The frustration you are hearing is generated by VV's lack of clarity and conflicting statements. I hope that we can use this opportunity to reach common ground that we would all want to be solid firm ground. If that is impossible, then it is better if we just quickly acknowledge that and not keep angering each other.

Thanks for considering the questions and hopefully understanding why many of us are confused. Perhaps we can wish for clarity and a united front in 2020.

Marilyn

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